

SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

- | | |
|---------------------|-----------------------------|
| - Trade name | AMMONIUM BIFLUORIDE |
| - Chemical Name | Ammonium hydrogendifluoride |
| - Synonyms | Ammonium hydrogen fluoride |
| - Molecular formula | NH ₄ F.HF |

1.2 Relevant identified uses of the substance or mixture and uses advised against

Uses of the Substance / Mixture

- Cleaning agent
- Metal treatment
- Non-metal-surface treatment products
- Oil & gas industry
- Chemical intermediate

1.3 Details of the supplier of the safety data sheet

Company

SOLVAY FLUORIDES, LLC
3333 RICHMOND AVENUE
77098-3099, HOUSTON
USA
Tel: +1-800-7658292; +1-713-5256700
Fax: +1-713-5257805

Prepared by

Solvay Product Stewardship (see Telephone number above)

Date Prepared

04/20/2015

1.4 Emergency telephone

FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT CONTACT: CHEMTREC 800-424-9300 within the United States and Canada, or 703-527-3887 for international collect calls.

SECTION 2: Hazards identification

2.1 Emergency overview

Appearance

Form: flakes, strongly hygroscopic
Physical state: solid
Color: white white
Odor: pungent

Warning statements

- Toxic if swallowed.
- Causes burns.
- Hazardous decomposition products formed under fire conditions.
- Hydrogen fluoride
- Chronic exposure may entail dental or skeletal fluorosis

2.2 Potential Health Effects

P00000020030

Version : 1.03 / CA (Z8)



SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

Inhalation effect

- Inhalation of vapors is irritating to the respiratory system, may cause throat pain and cough.
- Breathing difficulties
- Aspiration may cause pulmonary edema and pneumonitis.
- At high concentrations:
 - risk of hypocalcemia with nervous problems (tetany) and cardiac arrhythmia
- Repeated or prolonged exposure
 - sore throat.
 - Nose bleeding
 - chronic bronchitis.

Skin effect

- Causes severe burns.
- Risk of shock.
- Risk of hypocalcemia following the extent of the lesions.
- Symptoms
 - Irritation
 - Redness
 - Swelling of tissue
 - Burn

Eye effect

- May cause permanent eye injury.
- May cause blindness.
- Symptoms
 - Lachrymation
 - Redness
 - Swelling of tissue
 - Burn

Ingestion effect

- If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.
- Risk of throat (o)edema and suffocation.
- Risk of chemical pneumonitis from product inhalation.
- risk of hypocalcemia with nervous problems (tetany) and cardiac arrhythmia
- Risk of convulsions, loss of consciousness, deep coma and cardiopulmonary arrest.
- Symptoms
 - Nausea
 - Bloody vomiting
 - Abdominal pain
 - Diarrhea
 - Cough
 - Severe shortness of breath

Chronic effects

- This product does not contain any ingredient designated by IARC or ACGIH as probable or suspected human carcinogens.

SECTION 3: Composition/information on ingredients

P00000020030

Version : 1.03 / CA (Z8)



SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

3.1 Information on Components and Impurities

WHMIS Hazardous Ingredients and Impurities

Chemical Name	Identification number CAS-No.	Concentration [%]
Ammonium bifluoride	1341-49-7	>= 94
Ammonium fluoride ((NH ₄)F)	12125-01-8	<= 4

SECTION 4: First aid measures

4.1 Description of first-aid measures

In case of inhalation

- In case of accident by inhalation: remove casualty to fresh air and keep at rest.
- Oxygen or artificial respiration if needed.
- Victim to lie down in the recovery position, cover and keep him warm.
- Call a physician immediately.
- Take victim immediately to hospital.

In case of skin contact

- Call a physician immediately.
- Take victim immediately to hospital.
- Take off contaminated clothing and shoes immediately.
- Wash off with plenty of water.
- First treatment with calcium gluconate paste.

In case of eye contact

- Immediate medical attention is required.
- Take victim immediately to hospital.
- Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
- In the case of difficulty of opening the lids, administer an analgesic eye wash (oxybuprocaine).

In case of ingestion

- Call a physician immediately.
- Take victim immediately to hospital.
- If victim is conscious:
- Rinse mouth with water.
- Give to drink a 1% aqueous calcium gluconate solution.
- Do NOT induce vomiting.
- Artificial respiration and/or oxygen may be necessary.

4.2 Most important symptoms and effects, both acute and delayed

In case of inhalation**Symptoms**

- Breathing difficulties

Effects

- Inhalation of vapors is irritating to the respiratory system, may cause throat pain and cough.
- Aspiration may cause pulmonary edema and pneumonitis.
- At high concentrations:
- risk of hypocalcemia with nervous problems (tetany) and cardiac arrhythmia

P00000020030

Version : 1.03 / CA (Z8)



SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

Repeated or prolonged exposure

- sore throat
- Nose bleeding
- chronic bronchitis

In case of skin contact

Symptoms

- Irritation
- Redness
- Swelling of tissue
- Burn

Effects

- Causes severe burns.
- Risk of shock.
- Risk of hypocalcemia following the extent of the lesions.

In case of eye contact

Symptoms

- Lachrymation
- Redness
- Swelling of tissue
- Burn

Effects

- May cause permanent eye injury.
- May cause blindness.

In case of ingestion

Symptoms

- Nausea
- Bloody vomiting
- Abdominal pain
- Diarrhea
- Cough
- Severe shortness of breath

Effects

- If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.
- Risk of throat (o)edema and suffocation.
- Risk of chemical pneumonitis from product inhalation.
- risk of hypocalcemia with nervous problems (tetany) and cardiac arrhythmia
- Risk of convulsions, loss of consciousness, deep coma and cardiopulmonary arrest.

4.3 Indication of any immediate medical attention and special treatment needed

- no data available

SECTION 5: Firefighting measures

Flash point

Not applicable

Autoignition temperature

no data available

Flammability / Explosive limit

no data available

P00000020030

Version : 1.03 / CA (Z8)



SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

5.1 Extinguishing media

Suitable extinguishing media

- Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media

- Water may be ineffective.

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire fighting

- The product is not flammable.
- Not combustible.
- Hazardous decomposition products formed under fire conditions.
- Gives off hydrogen by reaction with metals.

Hazardous combustion products:

- Hydrogen fluoride
- Ammonia
- Nitrogen oxides (NOx)

5.3 Advice for firefighters

Special protective equipment for fire-fighters

- Wear self-contained breathing apparatus and protective suit.
- Wear chemical resistant oversuit
- Keep from any possible contact with water.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel

- Keep away from water.
- Evacuate personnel to safe areas.
- Keep people away from and upwind of spill/leak.

Advice for emergency responders

- Ventilate the area.
- Wear self-contained breathing apparatus and protective suit.
- Keep away from water.
- Prevent further leakage or spillage.

6.2 Environmental precautions

- Discharge into the environment must be avoided.
- If the product contaminates rivers and lakes or drains inform respective authorities.
- Prevent product from entering sewage system.

6.3 Methods and materials for containment and cleaning up

- Pick up and arrange disposal without creating dust.
- Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

- Refer to protective measures listed in sections 7 and 8.

P00000020030

Version : 1.03 / CA (Z8)



SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

SECTION 7: Handling and storage**7.1 Precautions for safe handling**

- Used in closed system
- Use only in well-ventilated areas.
- Keep away from incompatible products

Hygiene measures

- Ensure that eyewash stations and safety showers are close to the workstation location.
- Take off contaminated clothing and shoes immediately.
- Wash contaminated clothing before re-use.
- May not get in touch with:
- Leather
- When using do not eat, drink or smoke.
- Wash hands before breaks and at the end of workday.
- Handle in accordance with good industrial hygiene and safety practice.

7.2 Conditions for safe storage, including any incompatibilities**Packaging material****Suitable material**

- Paper.
- Polyethylene

Unsuitable material

- Metals

7.3 Specific end use(s)

- Contact your supplier for additional information

SECTION 8: Exposure controls/personal protection

Introductory Remarks: These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

8.1 Control parameters**Components with workplace occupational exposure limits**

Consult local authorities for acceptable exposure limits.

Ingredients	Value type	Value	Basis
Ammonium bifluoride	TWA	2.5 mg/m3	American Conference of Governmental Industrial Hygienists
			Bone damage, Fluorosis, Substances for which there is a Biological Exposure Index or Indices (see BEI® section), Not classifiable as a human carcinogen, varies Expressed as :Fluorine
Ammonium fluoride ((NH4)F)	TWA	2.5 mg/m3	American Conference of Governmental Industrial Hygienists
			Bone damage, Fluorosis, Substances for which there is a Biological Exposure Index or Indices (see BEI® section), Not classifiable as a human carcinogen, varies Expressed as :Fluorine

P00000020030

Version : 1.03 / CA (Z8)



SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

Biological Exposure Indices

Ingredients	Value type	Value	Basis
Ammonium bifluoride	BEI	2 mg/l Fluoride Urine Prior to shift (16 hours after exposure ceases)	American Conference of Governmental Industrial Hygienists
Ammonium bifluoride	BEI	3 mg/l Fluoride Urine End of shift (As soon as possible after exposure ceases)	American Conference of Governmental Industrial Hygienists
Ammonium fluoride ((NH ₄)F)	BEI	2 mg/l Fluoride Urine Prior to shift (16 hours after exposure ceases)	American Conference of Governmental Industrial Hygienists
Ammonium fluoride ((NH ₄)F)	BEI	3 mg/l Fluoride Urine End of shift (As soon as possible after exposure ceases)	American Conference of Governmental Industrial Hygienists

8.2 Exposure controls**Control measures****Engineering measures**

- Provide adequate ventilation.
- Apply technical measures to comply with the occupational exposure limits.

Individual protection measures**Respiratory protection**

- In the case of hazardous fumes, wear self contained breathing apparatus.
- In the case of dust or aerosol formation use respirator with an approved filter.
- Respirator with a dust filter
- Use only respiratory protection that conforms to international/ national standards.
- Use NIOSH approved respiratory protection.

Hand protection

- Impervious gloves
- Take note of the information given by the producer concerning permeability and break through times, and of special workplace conditions (mechanical strain, duration of contact).

Suitable material

- Neoprene
- Fluoroelastomer

Eye protection

P00000020030

Version : 1.03 / CA (Z8)



SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

- Dust proof goggles obligatory.

Skin and body protection

- impervious clothing

Hygiene measures

- Ensure that eyewash stations and safety showers are close to the workstation location.
- Take off contaminated clothing and shoes immediately.
- Wash contaminated clothing before re-use.
- May not get in touch with:
 - Leather
- When using do not eat, drink or smoke.
- Wash hands before breaks and at the end of workday.
- Handle in accordance with good industrial hygiene and safety practice.

SECTION 9: Physical and chemical properties

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product information phone number in Section 1 for its exact specifications.

9.1 Information on basic physical and chemical properties

<u>Appearance</u>	<u>Form:</u> flakes, strongly hygroscopic <u>Physical state:</u> solid <u>Color:</u> white white
<u>Particle size</u>	5 - 10 mm
<u>Odor</u>	pungent
<u>Odor Threshold</u>	no data available
<u>pH</u>	3.5 (5 %) <u>pKa:</u> 6.4
<u>Melting point/range</u>	258.1 - 259 °F (125.6 - 126 °C)
<u>Boiling point/boiling range</u>	463.1 - 464 °F (239.5 - 240 °C) Thermal decomposition: yes
<u>Flash point</u>	Not applicable
<u>Evaporation rate (Butylacetate = 1)</u>	no data available
<u>Flammability (solid, gas)</u>	The product is not flammable.
<u>Flammability / Explosive limit</u>	<u>Explosiveness:</u> Not explosive
<u>Autoignition temperature</u>	no data available
<u>Vapor pressure</u>	0.81 mmHg (1.08 hPa) (68 °F (20 °C))

SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

<u>Vapor density</u>	no data available
<u>Density</u>	<u>Bulk density:</u> 700 kg/m3
	<u>Relative density:</u> 1.5
<u>Solubility</u>	<u>Water solubility :</u> 602 g/l (68 °F (20 °C))
<u>Partition coefficient: n-octanol/water</u>	Not applicable
<u>Thermal decomposition</u>	>= 463.1 °F (>= 239.5 °C)
<u>Viscosity</u>	no data available
<u>Explosive properties</u>	no data available
<u>Oxidizing properties</u>	Not considered as oxidizing.

9.2 Other information

<u>Molecular weight</u>	57 g/mol
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SECTION 10: Stability and reactivity

10.1 Reactivity

- Reacts violently with water.

10.2 Chemical stability

- Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

- no data available

10.4 Conditions to avoid

- Extremes of temperature and direct sunlight.
- Exposure to air or moisture over prolonged periods.

10.5 Incompatible materials

- Strong acids and strong bases
- Silicate containing materials (glass, cement,...).
- Metals

10.6 Hazardous decomposition products

- Hydrogen fluoride
- Ammonia
- Nitrogen oxides (NOx)

P00000020030

Version : 1.03 / CA (Z8)



SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Acute oral toxicity LD50 : 130 mg/kg - Rat

Acute inhalation toxicity no data available

Acute dermal toxicity

sodium fluoride LD 10 : ca. 300 mg/kg - Mouse

Acute toxicity (other routes of administration)

no data available

Skin corrosion/irritation

Corrosive

Serious eye damage/eye irritation

Risk of serious damage to eyes.

Respiratory or skin sensitization

Did not cause sensitization on laboratory animals.

Mutagenicity

Genotoxicity in vitro

Test substance: fluoride
In vitro tests did not show mutagenic effects

Genotoxicity in vivo

Test substance: fluoride
In vivo tests did not show mutagenic effects

Carcinogenicity

no data available

This product does not contain any ingredient designated as probable or suspected human carcinogens by:

IARC
ACGIH

Toxicity for reproduction and development

Toxicity to reproduction / fertility

sodium fluoride

Rat
NOAEL parent: 10 - 14 mg/kg

Rabbit
NOAEL parent: 14 mg/kg
not significant
Developmental Toxicity

Developmental Toxicity/Teratogenicity no data available

SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

STOT

STOT-single exposure no data available

STOT-repeated exposure Oral - Rat
NOEL: 300 ppm(m)
Test substance: fluorides
Target Organs: Bone, Teeth, Mucous membranes, Gastrointestinal tract
observed effect

Aspiration toxicity no data available

Further information Toxic effect linked with corrosive properties

SECTION 12: Ecological information

12.1 Toxicity

Aquatic Compartment

Acute toxicity to fish
sodium fluoride LC50 - 96 h : 51 mg/l - Fishes, Salmo gairdneri
static test

Fresh water

Acute toxicity to daphnia and other aquatic invertebrates.
sodium fluoride EC50 - 48 h : 26 mg/l - Daphnia magna (Water flea)
Fresh water

EC50 - 96 h : 10.5 mg/l - Daphnia magna (Water flea)
salt water

Chronic toxicity to fish
sodium fluoride NOEC: 4 mg/l - 21 Days - Oncorhynchus mykiss (rainbow trout)
static test
Fresh water

Chronic toxicity to daphnia and other aquatic invertebrates.
sodium fluoride NOEC: 8.9 mg/l - 21 Days - Daphnia magna (Water flea)
static test
Fresh water

12.2 Persistence and degradability

Abiotic degradation

Stability in water Medium, Water, Soil, ionization/neutralization
Medium, Water, Soil, complexation/precipitation of inorganic materials

SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

Photodegradation

neutralization by natural alkalinity
Medium
Air

Biodegradation**Biodegradability**

The methods for determining the biological degradability are not applicable to inorganic substances.

12.3 Bioaccumulative potential**Bioconcentration factor (BCF)**

Does not bioaccumulate.

12.4 Mobility in soil**Adsorption potential (Koc)**

Water
Solubility(ies)
Mobility

Soil/sediments
potential adsorption
pH
fluorides

Air
mobility as solid aerosols

12.5 Results of PBT and vPvB assessment

no data available

12.6 Other adverse effects

no data available

Ecotoxicity assessment**Acute aquatic toxicity**
sodium fluoride

Harmful to aquatic organisms.

Chronic aquatic toxicity
sodium fluoride

. low chronic toxicity.

Remarks

No data is available on the product itself. Ecological data therefore refers only to the effects of the decomposition products. Harmful to aquatic organisms. Nevertheless, hazard for the environment is limited due to product properties: . low chronic toxicity. Product fate is highly dependent on environmental conditions: pH, temperature, redox potential, mineral and organic content of the medium ,...

SECTION 13: Disposal considerations**13.1 Waste treatment methods****Product Disposal**

- Where possible recycling is preferred to disposal or incineration.

P00000020030

Version : 1.03 / CA (Z8)



SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

- If recycling is not practicable, dispose of in compliance with local regulations.
- Must be incinerated in a suitable incineration plant holding a permit delivered by the competent authorities.
- Use lime or, preferably, calcium hydroxide to precipitate the fluoride ion in the form of CaF_2 .
- Filtrate the product and send the cake to a landfill for industrial waste.
- Dispose of wastes in an approved waste disposal facility.
- In accordance with local and national regulations.

Advice on cleaning and disposal of packaging

- Dispose of as unused product.
- Where possible recycling is preferred to disposal or incineration.

SECTION 14: Transport information

Transportation status: IMPORTANT! Statements below provide additional data on listed transport classification. The listed Transportation Classification does not address regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

TDG

14.1 UN number	UN 1727
14.2 Proper shipping name	AMMONIUM HYDROGENDIFLUORIDE, SOLID
14.3 Transport hazard class	8
Label(s)	8
14.4 Packing group	
Packing group	II
ERG No	154
14.5 Environmental hazards	NO
Marine pollutant	

DOT

14.1 UN number	UN 1727
14.2 Proper shipping name	AMMONIUM HYDROGENDIFLUORIDE, SOLID
14.3 Transport hazard class	8
Label(s)	8
14.4 Packing group	
Packing group	II
ERG No	154
14.5 Environmental hazards	NO
Marine pollutant	

NOM

no data available

IMDG

14.1 UN number	UN 1727
14.2 Proper shipping name	AMMONIUM HYDROGENDIFLUORIDE, SOLID

P00000020030

Version : 1.03 / CA (Z8)



SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

14.3 Transport hazard class 8
Label(s) 8

14.4 Packing group II
Packing group II

14.5 Environmental hazards NO
Marine pollutant

14.6 Special precautions for user
EmS F-A , S-B

For personal protection see section 8.

IATA

14.1 UN number UN 1727

14.2 Proper shipping name AMMONIUM HYDROGENDIFLUORIDE, SOLID

14.3 Transport hazard class 8
Label(s): 8

14.4 Packing group II
Packing group II

Packing instruction (cargo aircraft) 863
Max net qty / pkg 50.00 kg
Packing instruction (passenger aircraft) 859
Max net qty / pkg 15.00 kg

14.5 Environmental hazards NO

14.6 Special precautions for user
For personal protection see section 8.

Note: The above regulatory prescriptions are those valid on the date of publication of this sheet. Given the possible evolution of transportation regulations for hazardous materials, it would be advisable to check their validity with your sales office.

SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

SECTION 15: Regulatory information**15.1 Notification status**

Inventory Information	Status
United States TSCA Inventory	- Listed on Inventory
Mexico INSQ (INSQ)	- In compliance with the inventory
Canadian Domestic Substances List (DSL)	- Listed on Inventory
New Zealand. Inventory of Chemical Substances	- In compliance with the inventory
Australia Inventory of Chemical Substances (AICS)	- Listed on Inventory
Japan. CSCL - Inventory of Existing and New Chemical Substances	- Listed on Inventory
Korea. Korean Existing Chemicals Inventory (KECI)	- Listed on Inventory
China. Inventory of Existing Chemical Substances in China (IECSC)	- Listed on Inventory
Philippines Inventory of Chemicals and Chemical Substances (PICCS)	- Listed on Inventory

15.2 WHMIS (Workplace Hazardous Materials Information System) Classification

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.

Classification

D2B: Toxic Material Causing Other Toxic Effects
E: Corrosive Material

15.3 Other regulations

no data available

SECTION 16: Other information**NFPA (National Fire Protection Association) - Classification**

Health	3 serious
Flammability	0 minimal
Instability or Reactivity	1 slight
Special Notices	None

HMIS (Hazardous Materials Identification System (Paint & Coating)) - Classification

Health	3 serious
Flammability	0 minimal
Reactivity	1 slight
PPE	Determined by User; dependent on local conditions

Key or legend to abbreviations and acronyms used in the safety data sheet

- TWA 8-hour, time-weighted average
- ACGIH American Conference of Governmental Industrial Hygienists
- OSHA Occupational Safety and Health Administration

P00000020030

Version : 1.03 / CA (Z8)



SAFETY DATA SHEET

AMMONIUM BIFLUORIDE

Revision Date 04/20/2015

- | | |
|---------|---|
| - NTP | National Toxicology Program |
| - IARC | International Agency for Research on Cancer |
| - NIOSH | National Institute for Occupational Safety and Health |

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in any other manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.